# ADA PINPOINT TOPIC PACKS

(1)Completing the Square (7 Qns)
(2)Complete the Square (0 Qns)
(3)Recognising cubic and quadratic graphs (1 Qns)
(4)Drawing Quadratic Graphs (6 Qns)

20_to_100_Percent_Pinpoint_AI_Pack

Time Allocation = 44mins , Max = 39 Marks

# Calculated Grade Boundaries:

| Grade | Marks |
|---|---|
| 3+ | 3 |
| 4- | 5 |
| 4 | 7 |
| 4+ | 9 |
| 5- | 11 |
| 5 | 13 |
| 5+ | 15 |
| 6- | 17 |
| 6 | 19 |
| 6+ | 21 |
| 7- | 23 |
| 7 | 25 |
| 7+ | 27 |
| 8- | 29 |
| 8 | 31 |
| 8+ | 33 |
| 9- | 35 |

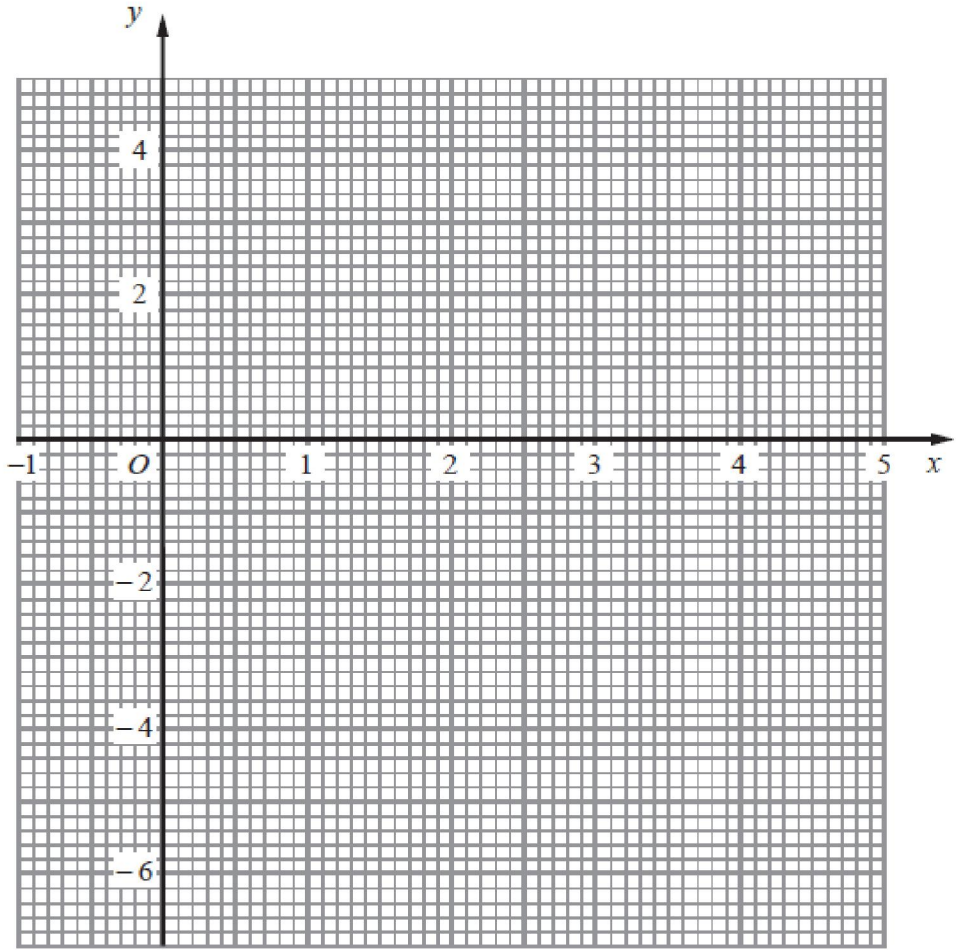
| | |
|---|---|
| 9 | 37 |
| 9+ | 39 |

# Question 1 (AO1): 70% of students got this right (4 marks)

**10.** (a) Complete the table of values for $y = x^2 - 4x - 2$

| $x$ | –1 | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|
| $y$ | | –2 | –5 | | | –2 | 3 |

(b) On the grid, draw the graph of $y = y = x^2 - 4x - 2$



# Question 2 (AO2): (No Calc) 48% of students got this right (6 marks)

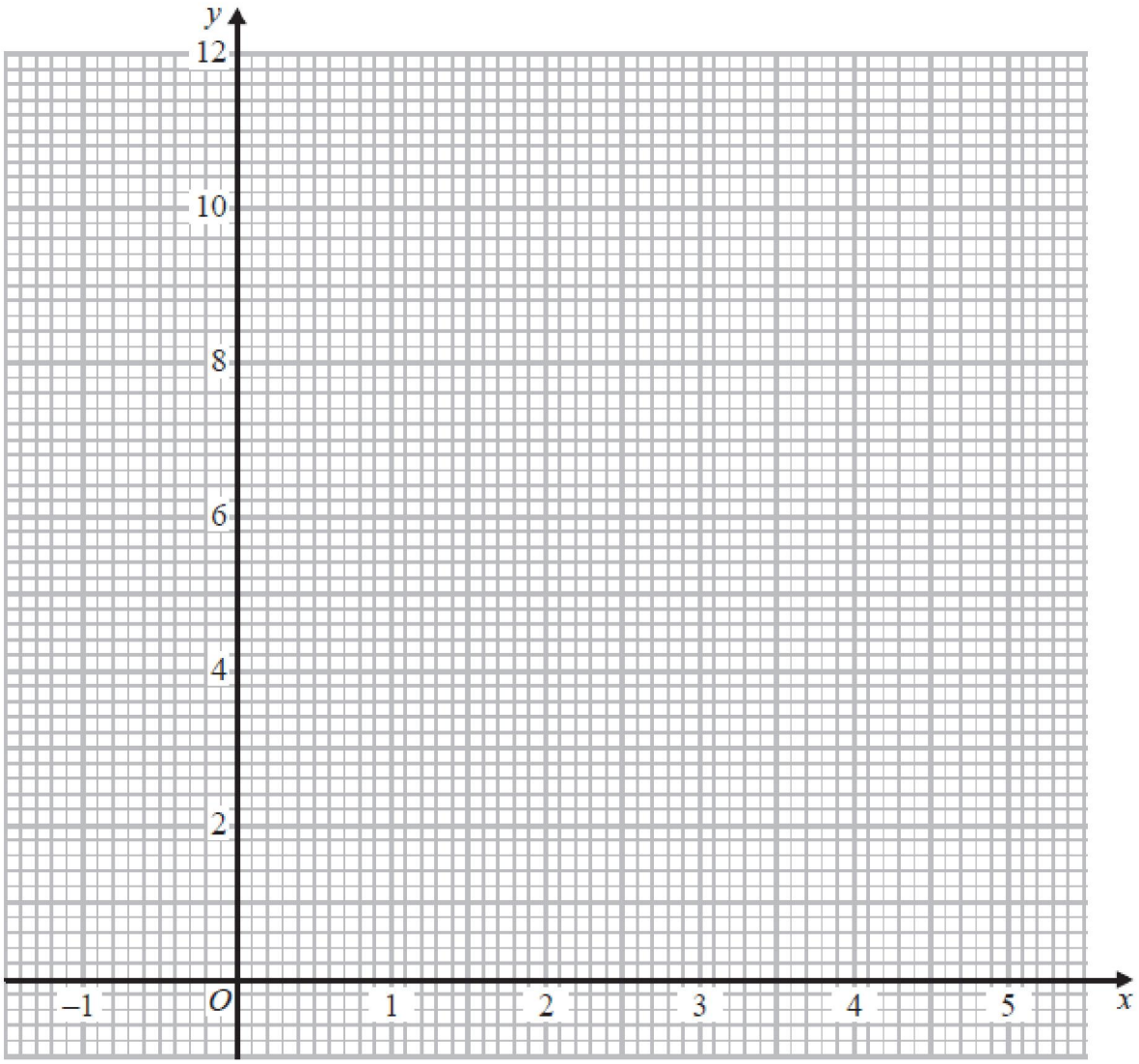
**12** (*a*) Complete the table of values for $y = x^2 - 3x + 2$

| $x$ | –1 | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|
| $y$ | 6 | | | | 2 | | 12 |

**(2)**

(*b*) On the grid, draw the graph of $y = x^2 - 3x + 2$ for values of $x$ from –1 to 5

**(2)**




(*c*) Find estimates for the solutions of the equation $x^2 - 3x + 2 = 4$

.....

**(2)**



**(Total for Question 12 is 6 marks)**

# Question 3 (AO1): 39% of students got this right (2 marks)

**13** Write $x^2 + 6x - 7$ in the form $(x + a)^2 + b$ where $a$ and $b$ are integers.

# Question 4 (AO2): 32% of students got this right (3 marks)

**18** $(x - 8)(x + 4) = (x - a)^2 + b$ for all values of $x$.

Find the value of $a$ and the value of $b$.

# Question 5 (AO1): 28% of students got this right (3 marks)

**19.** By completing the square, find the coordinates of the turning point of the curve with equation $y = x^2 + 10x + 18$

You must show all your working.

(..... , .....)

**(Total for Question 19 is 3 marks)**

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# Question 6 (AO2): (No Calc) 27% of students got this right (3 marks)

**17** Solve $x^2 - 6x - 8 = 0$
Write your answer in the form $a \pm \sqrt{b}$ where $a$ and $b$ are integers.

# Question 7 (AO1): 24% of students got this right (2 marks)

**16** Solve $(x - 2)^2 = 3$

Give your solutions correct to 3 significant figures.

# Question 8 (AO1): 16% of students got this right (4 marks)

**23** (*a*) Write $2x^2 + 16x + 35$ in the form $a(x + b)^2 + c$ where $a$, $b$, and $c$ are integers.

(*b*) Hence, or otherwise, write down the coordinates of the turning point of the graph of $y = 2x^2 + 16x + 35$

# Question 9 (AO2): (No Calc) 10% of students got this right (4 marks)

**21** Sketch the graph of $f(x) = -x^2 - 3x + 5$, showing the coordinates of the turning point and the coordinates of any intercepts with the coordinate axes.

**(Total 4 mark)**

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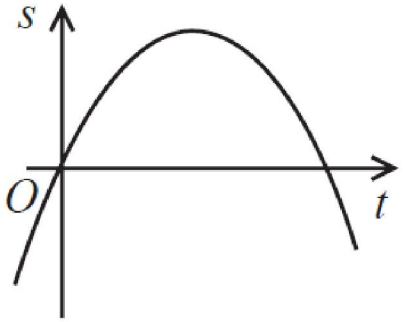
# Question 10 (AO3): (No Calc) 7% of students got this right (4 marks)

**14** A particle $P$ is moving in a straight line.
$O$ is a fixed point on the straight line.



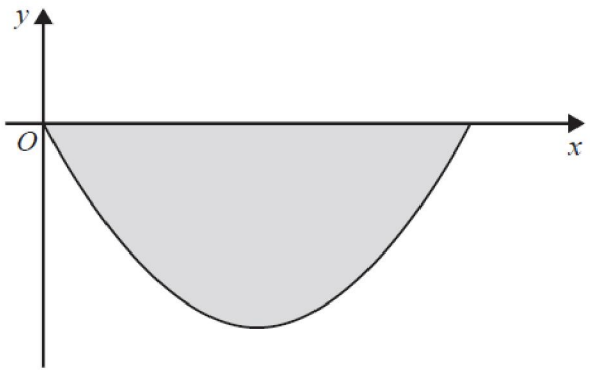

The distance, $s$ metres, of $P$ from $O$ at time $t$ seconds is given by

$$s = 80t - 5t^2$$

Use algebra to find the greatest distance of $P$ from $O$ when $0 \leqslant t \leqslant 16$

# Question 11 (AO3): (No Calc) 5% of students got this right (4 marks)

**15** Here is a sketch of a vertical cross section through the centre of a bowl.




The cross section is the shaded region between the curve and the *x*-axis.

The curve has equation $y = \frac{x^2}{5} - 6x$ where *x* and *y* are both measured in centimetres.
Find the depth of the bowl.

..... cm

**(Total for Question 15 is 4 marks)**

# Answers to Qn 1 (AO1): 70% of students got this right

| Question | | Working | Answer | Mark | Notes |
|---|---|---|---|---|---|
| **10** | (a) | | 3, – 6, – 5 | 2 | B2 cao for all 3<br>(B1 for any 1 or 2 correct) |
| | (b) | | Quadratic graph | 2 | B2 for a fully correct graph<br>OR<br>B1 for all 7 points ft on (a) plotted correctly ± 1 sq<br>B1 for a smooth curve through all 7 of their plotted points depending on at least B1 in (a) |

# Answers to Qn 2 (AO2): (No Calc) 48% of students got this right

| | | | | | |
|---|---|---|---|---|---|
| 12 | (a) | | 4, 1, 1, 9 | 2 | B2 for 4, 1, 1, 9<br>(B1 for at least two of 4, 1, 1, 9); could be taken from graph |
| | (b) | | Correct curve | 2 | M1 (ft) for at least 5 points plotted correctly<br>A1 for a fully correct curve |
| | (c) | | 0.6, 3.4 | 2 | M1 (ft if M1 awarded in (b) and at least B1 in (a)) for indicating a point or line drawn at $y=4$, or one solution given<br>A1 (ft) for both solutions |

# Answers to Qn 3 (AO1): 39% of students got this right

| Part | Working an or answer examiner might expect to see | Mark | Notes |
|---|---|---|---|
| 13 | $x^2 + 6x - 7 = x^2 + 2ax + a^2 + b$ | 1 | This mark is given for a method to complete the square |
| | $(x + 3)^2 - 16$ | 1 | This mark is given for the correct answer only |

# Answers to Qn 4 (AO2): 32% of students got this right

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 18 | | 2, −36 | P1 | for process to expand $(x - 8)(x + 4)$ or $(x - a)^2$ |
| | | | P1 | for process to find value of $a$ (may be implied by $a = 2$) |
| | | | A1 | cao |

# Answers to Qn 5 (AO1):  28% of students got this right

| | | | | |
|---|---|---|---|---|
| 19 | | (-5, -7) | M1<br>M1<br>A1 | Method to start to complete the square, e.g. $(x + 5)^2$<br>$(x + 5)^2 - 7$<br>cao (dep on method seen) |

# Answers to Qn 6 (AO2): (No Calc) 27% of students got this right

| Paper 1MA1: 1H | | | |
|---|---|---|---|
| **Question** | **Working** | **Answer** | **Notes** |
| 17 | | $3 \pm \sqrt{17}$ | M1 For $(x-3)^2 - 9 - 8\ (=0)$ or $(x=)\ \frac{-(-6)\pm\sqrt{(-6)^2-4(1)(-8)}}{2(1)}$ allow sign error for $b$<br>M1 For $x - 3 = \pm\sqrt{17}$ or $x = \frac{6\pm\sqrt{68}}{2}$<br>A1 cao |

# Answers to Qn 7 (AO1): 24% of students got this right

| Paper: 1MA1/2H | | | | |
|---|---|---|---|---|
| **Question** | **Working** | **Answer** | **Mark** | **Notes** |
| 16 | $\frac{--4 \pm \sqrt{(-4)^2 - 4 \times 1 \times 1}}{2 \times 1}$ | 0.268, 3.73 | M1 | for $x - 2 = \pm\sqrt{3}$ oe or one solution or use of $x^2 - 4x + 1 = 0$ to substitute into formula (allow one error in substitution) |
| | | | A1 | 0.267 – 0.27, 3.7 – 3.74 |

# Answers to Qn 8 (AO1): 16% of students got this right

| **Paper 1MA1: 3H** | | | |
|---|---|---|---|
| **Question** | **Working** | **Answer** | **Notes** |
| 23 | | $2(x + 4)^2 + 3$ | P1 process to find $a$, eg $2x^2 + 16x + 35 = 2(x^2 + \ldots)$ or $a = 2$<br>P1 for $2((x + 4)^2 + \ldots))$ or $b = 4$<br>A1 for $2(x + 4)^2 + 3$ or $a = 2$, $b = 4$, $c = 3$ |
| | | $(-4, 3)$ | B1 ft from answer of form $a(x + b)^2 + c$ |

# Answers to Qn 9 (AO2): (No Calc) 10% of students got this right

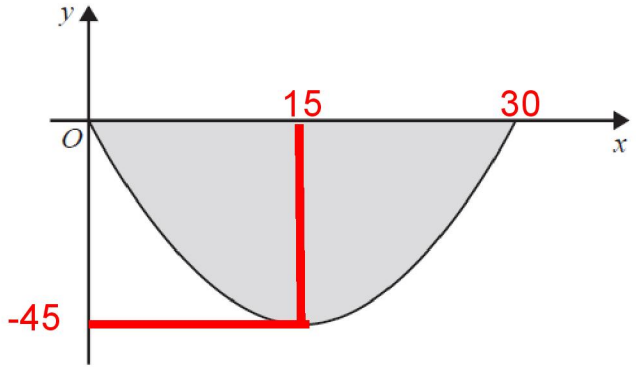
| | | | | | |
|---|---|---|---|---|---|
| **21.** | | | | 4 | M1 for $-((x+1.5)^2-(1.5)^2-5)$ or attempt to find points to plot - must have at least 3 correct points evaluated or correct method to find $x$ axis intercepts<br>A1 for $-((x+1.5)^2-7.25)$ or parabola with marximum marked at $(-1.5, 7.25)$ or $\frac{3\pm\sqrt{29}}{2}$<br>C1 for parabola drawn with maxiumum in 2nd quadrant or $y$ intercept $(0, 5)$ or with $x$ axis intercepts at $\left(\frac{3\pm\sqrt{29}}{2},0\right)$<br>C1 for parabola drawn with maxiumum (-1.5, 7.25) and $y$ intercept $(0, 5)$ and $x$ axis intercepts at $\left(\frac{3\pm\sqrt{29}}{2},0\right)$ |

# Answers to Qn 10 (AO3): (No Calc) 7% of students got this right

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 14 | | 320 | P1 | for factorising to get $5(16t - t^2)$ or $5t(16 - t)$ or for a sketch of the graph of $s = 80t - 5t^2$ |
| | | | P1 | for $-5[(t - 8)^2 - 64]$ oe or identify turning point at $t = 8$ from their graph |
| | | | P1 | (dep P1) for substitution of $t = 8$ into $s = 80t - 5t^2$ |
| | | | A1 | cao |

# Answers to Qn 11 (AO3): (No Calc) 5% of students got this right

**15** Here is a sketch of a vertical cross section through the centre of a bowl.




The cross section is the shaded region between the curve and the $x$-axis.

The curve has equation $y = \frac{x^2}{5} - 6x$ where $x$ and $y$ are both measured in centimetres.
Find the depth of the bowl.

Find x-intercepts: $y = \frac{x^2}{5} - 6x = 0$

$$x^2 - 30x = 0$$

$$x(x - 30) = 0$$

So x-intercepts are 0 and 30.

Minimum at x = 15

So $y = \frac{15^2}{5} - 6 \times 15 = 45 - 90 = -45$

Hence depth of bowl = 45 cm

..... cm

**(Total for Question 15 is 4 marks)**